

# PERFORMANCE TABLES

## A7+ Hybrid Adhesive

## Factored Steel Strength for Threaded Rod

Threaded Rod Dia. In. (mm)	Tension kN (lb), Nsar <sup>3</sup>			Shear kN (lb) Vsar <sup>4</sup>			Seismic Shear kN (lb), Vsar,seismic <sup>5</sup>		
	Carbon Steel A36 <sup>1</sup>	Carbon Steel A193 B7 <sup>1</sup>	Stainless F593 <sup>2</sup>	Carbon Steel A36 <sup>1</sup>	Carbon Steel A193 B7 <sup>1</sup>	Stainless F593 <sup>2</sup>	Carbon Steel A36 <sup>1</sup>	Carbon Steel A193 B7 <sup>1</sup>	Stainless F593 <sup>2</sup>
3/8 (9.5)	14 (3,060)	29 (6,589)	19 (4,382)	6 (1,434)	14 (3,089)	9 (2,033)	4 (1,004)	10 (2,162)	6 (1,423)
1/2 (12.7)	25 (5,596)	54 (12,063)	36 (8,021)	14 (3,149)	30 (6,783)	17 (3,724)	10 (2,204)	21 (4,748)	12 (2,607)
5/8 (15.9)	40 (8,915)	85 (19,210)	57 (12,775)	22 (5,017)	48 (10,806)	26 (5,931)	16 (3,512)	34 (7,564)	18 (4,152)
3/4 (19.1)	59 (13,192)	126 (28,431)	67 (15,104)	33 (7,421)	71 (15,995)	31 (7,011)	23 (5,194)	50 (11,196)	22 (4,908)
7/8 (22.2)	81 (18,210)	175 (39,243)	93 (20,890)	46 (10,245)	98 (22,077)	43 (9,699)	32 (7,171)	69 (15,454)	30 (6,789)
1 (25.4)	106 (23,888)	229 (51,483)	122 (27,403)	60 (13,439)	129 (28,962)	57 (12,724)	42 (9,407)	90 (20,273)	40 (8,907)
1-1/4 (31.8)	170 (38,223)	366 (82,375)	195 (43,819)	96 (21,503)	206 (46,334)	90 (20,343)	67 (15,052)	144 (32,433)	63 (14,240)

1 Values correspond to a ductile steel element

3 Tension values calculated according to Cl. D6.1.2 in CSA A23.3-14 Annex D

5 Seismic shear was calculated according to Vsar\*aV,seis

2 Values correspond to a brittle steel element

4 Shear values calculated according to Cl. D7.1.2 in CSA A23.3-14 Annex D

## A7+ Hybrid Adhesive

## Concrete Breakout and Bond Strength for Threaded Rod

Nominal Anchor Diameter	Symbol	Units	Nominal Rod Diameter In. (mm)							
			3/8 (9.5)	1/2 (12.7)	5/8 (15.9)	3/4 (19.1)	7/8 (22.2)	1 (25.4)	1-1/4 (31.8)	
<b>Concrete Breakout</b>										
Effectiveness factor for uncracked concrete	$k_{uncr}$	–	10							
Effectiveness factor for cracked concrete	$k_{cr}$	–	7							
Modification factor for cracked and uncracked	$\psi_{c,N}$	–	1							
Minimum concrete thickness	$h_{min}$	mm	$h_{ef} + 31.75$			$h_{ef} + 2d$				
Anchor embedment depth – minimum	$h_{ef,min}$	mm	60.3	69.9	79.4	88.9	88.9	101.6	127.0	
Minimum spacing	$s_{min}$	mm	23.8	38.1	63.5	76.2	88.9	101.6	127.0	
Minimum edge distance	$c_{min}$	mm	23.8	38.1	63.5	76.2	88.9	101.6	127.0	
Critical edge distance	$c_{ac}$	mm	See Section 4.1.10 of the evaluation report ESR 3903							
Material resistance factor for concrete	$\Phi_c$	–	0.65							
Strength reduction factor for tension, concrete failure modes <sup>3,4</sup>	R	Cond. A	1.15							
	R	Cond. B	1							
Strength reduction factor for shear, concrete failure modes <sup>3,4</sup>	R	Cond. A	1.15							
	R	Cond. B	1							
Modification Factor for concrete density	$\lambda$	–	1							
<b>Bond Strength</b>										
			Nominal Rod Diameter In. (mm)							
			3/8 (9.5)	1/2 (12.7)	5/8 (15.9)	3/4 (19.1)	7/8 (22.2)	1 (25.4)	1-1/4 (31.8)	
Temperature Range A <sup>1</sup>	Characteristic Bond Strength for Uncracked Concrete	$T_{k,uncr}$	MPa (psi)	12.2 (1770)	12.2 (1770)	12.2 (1770)	12.2 (1770)	10.3 (1490)	10.3 (1490)	10.3 (1490)
	Characteristic Bond Strength for Cracked Concrete	$T_{k,cr}$	MPa (psi)	7.3 (1060)	5.4 (790)	5.9 (860)	6.1 (885)	4.8 (695)	4.5 (655)	4.0 (585)
Temperature Range B <sup>2</sup>	Characteristic Bond Strength for Uncracked Concrete	$T_{k,uncr}$	MPa (psi)	8.8 (1275)	8.8 (1275)	8.8 (1275)	8.8 (1275)	7.4 (1080)	7.4 (1080)	7.4 (1080)
	Characteristic Bond Strength for Cracked Concrete	$T_{k,cr}$	MPa (psi)	5.3 (1080)	3.9 (570)	4.3 (620)	4.4 (640)	3.4 (500)	3.3 (475)	2.9 (420)
Continuous Inspection	Strength Reduction Factor – Dry Concrete	$\Phi_{dry,ci}$	–	0.65	0.65	0.65	0.65	0.65	0.65	0.65
	Strength Reduction Factor – Water-Saturated Concrete	$\Phi_{sat,ci}$	–	0.65	0.65	0.65	0.65	0.65	0.65	0.65
	Strength Reduction Factor – Water-Filled Holes	$\Phi_{wf,ci}$	–	0.65	0.65	0.65	0.65	0.65	0.65	0.65
	Strength Reduction Factor – Submerged Concrete	$\Phi_{sub,ci}$	–	0.65	0.55	0.55	0.65	0.65	0.55	0.65
Periodic Inspection	Strength Reduction Factor – Dry Concrete	$\Phi_{dry,pi}$	–	0.55	0.55	0.55	0.55	0.55	0.55	0.65
	Strength Reduction Factor – Water-Saturated Concrete	$\Phi_{sat,pi}$	–	0.65	0.65	0.65	0.65	0.65	0.65	0.65
	Strength Reduction Factor – Water-Filled Holes	$\Phi_{wf,pi}$	–	0.65	0.65	0.65	0.65	0.65	0.65	0.65
	Strength Reduction Factor – Submerged Concrete	$\Phi_{sub,pi}$	–	0.65	0.45	0.45	0.65	0.55	0.45	0.65
Reduction factor for seismic tension		$a_{N,seis}$	–	0.89	0.75	0.76	0.66	0.77	0.80	0.80

1 Temperature Range A: Max short term temperature = 130°F (55°C), max long term temperature = 110°F (43°C)

2 Temperature Range B: Max short term temperature = 176°F (80°C), max long term temperature = 110°F (43°C)

3 Condition A applies where the potential concrete failure surfaces are crossed by supplementary reinforcement proportioned to tie the potential concrete failure prism into the structural member except where pullout or pryout resistance governs

4 Condition B applies where supplementary reinforcement is not provided or where pullout or pryout strength governs

## PERFORMANCE TABLES

### A7+ Hybrid Adhesive Factored Steel Strength for Reinforcing Bars, kN (lbf)

US Rebar Size	ASTM A615 Grade 60 Rebar			CA Rebar Size	CSA G30.18 Grade 400		
	Tension In. (mm)	Shear In. (mm)	Seismic Shear In. (mm)		Tension In. (mm)	Shear In. (mm)	Seismic Shear In. (mm)
No. 3	29.9 (6,732)	16.8 (3,787)	135.6 (3,446)	10M	37 (8,255)	21 (4,643)	14 (3,250)
No. 4	54.4 (12,240)	30.6 (6,885)	28.0 (6,265)	15M	73 (16,510)	41 (9,287)	29 (6,501)
No. 5	84.4 (18,972)	47.5 (10,672)	43.0 (9,711)	20M	110 (24,765)	62 (13,930)	43 (9,751)
No. 6	119.8 (26,928)	67.4 (15,147)	61.0 (13,632)	25M	184 (41,275)	103 (23,217)	72 (16,252)
No. 7	163.3 (36,720)	91.9 (20,655)	83.0 (18,590)	30M	257 (57,785)	145 (32,504)	101 (22,753)
No. 8	215.1 (48,348)	121.0 (27,196)	86.0 (19,309)				
No. 9	272.2 (61,200)	153.1 (34,425)	109.0 (24,442)				
No. 10	345.7 (77,724)	194.5 (43,720)	138.0 (31,041)				

1 Values correspond to a ductile steel element per standards above  
 2 Tension values calculated according to Cl. D6.1.2 in CSA A23.3-14 Annex D  
 3 Shear values calculated according to Cl. D7.1.2 in CSA A23.3-14 Annex D  
 4 Seismic shear was calculated according to  $V_{sar} \cdot a_{V,seis}$

### A7+ Hybrid Adhesive Concrete Breakout and Bond Strength for Rebar

Nominal Anchor Size	Symbol	Units	Reinforcing Steel Bar Size									
	do		No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 9		
<b>Concrete Breakout</b>												
Effectiveness factor for uncracked concrete	$k_{uncr}$	–	10									
Effectiveness factor for cracked concrete	$k_{cr}$	–	7									
Minimum concrete thickness	$h_{min}$	mm	$h_{ef} + 31.75$					$h_{ef} + 2do$				
Anchor embedment depth – minimum	$h_{ef,min}$	mm	60.3	69.9	79.4	88.9	88.9	101.6	114.3	127.0		
Minimum spacing	$s_{min}$	mm	23.8	38.1	63.5	76.2	88.9	101.6	114.3	127.0		
Minimum edge distance	$c_{min}$	mm	23.8	38.1	63.5	76.2	88.9	101.6	114.3	127.0		
Critical edge distance	$c_{ac}$	mm	See Section 4.1.10 of the evaluation report ESR 3903									
Material resistance factor for concrete	$\Phi_c$	–	0.65									
Strength reduction factor for tension, concrete failure modes <sup>3,4</sup>	R	Cond. A	1.15									
	R	Cond. B	1									
Strength reduction factor for shear, concrete failure modes <sup>3,4</sup>	R	Cond. A	1.15									
	R	Cond. B	1									
Modification Factor for concrete density	$\lambda$	–	1									
<b>Bond Strength</b>												
Nominal Anchor Size			No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10		
Temperature Range A <sup>2</sup>	Characteristic Bond Strength for Uncracked Concrete	$T_{k,uncr}$	MPa (psi)	11.5 (1675)	13.3 (1935)	13.1 (1900)	11.7 (1700)	11.3 (1635)	11.1 (1615)	10.9 (1585)	10.7 (1550)	
	Characteristic Bond Strength for Cracked Concrete	$T_{k,cr}$	MPa (psi)	5.2 (755)	5.2 (755)	5.2 (755)	4.0 (585)	4.0 (585)	4.0 (585)	4.0 (585)	4.2 (605)	
Temperature Range B <sup>3,4</sup>	Characteristic Bond Strength for Uncracked Concrete	$T_{k,uncr}$	MPa (psi)	8.3 (1210)	9.6 (1395)	9.5 (1210)	8.5 (1230)	8.1 (1180)	8.0 (1165)	7.9 (1145)	7.7 (1120)	
	Characteristic Bond Strength for Cracked Concrete	$T_{k,cr}$	MPa (psi)	3.8 (545)	3.8 (545)	3.8 (545)	2.9 (420)	2.9 (420)	2.9 (420)	2.9 (420)	3.0 (435)	
Continuous Inspection	Strength Reduction Factor – Dry Concrete	$\Phi_{dry,ci}$	–	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	
	Strength Reduction Factor – Water-Saturated Concrete	$\Phi_{sat,ci}$	–	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	
	Strength Reduction Factor – Water-Filled Holes	$\Phi_{wf,ci}$	–	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	
	Strength Reduction Factor – Submerged Concrete	$\Phi_{sub,ci}$	–	0.65	0.55	0.55	0.65	0.65	0.55	0.55	0.65	
Periodic Inspection	Strength Reduction Factor – Dry Concrete	$\Phi_{dry,pi}$	–	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.65	
	Strength Reduction Factor – Water-Saturated Concrete	$\Phi_{sat,pi}$	–	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	
	Strength Reduction Factor – Water-Filled Holes	$\Phi_{wf,pi}$	–	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	
	Strength Reduction Factor – Submerged Concrete	$\Phi_{sub,pi}$	–	0.65	0.45	0.45	0.65	0.55	0.45	0.45	0.65	
Reduction factor for seismic tension	$a_{N,seis}$	–	0.92	0.92	0.92	0.82	0.82	0.82	0.82	0.82		

1 Temperature Range A: Max short term temperature = 130°F (55°C), max long term temperature = 110°F (43°C)

2 Temperature Range B: Max short term temperature = 176°F (80°C), max long term temperature = 110°F (43°C)

3 Condition A applies where the potential concrete failure surfaces are crossed by supplementary reinforcement proportioned to tie the potential concrete failure prism into the structural member except where pullout or pryout resistance governs

4 Condition B applies where supplementary reinforcement is not provided or where pullout or pryout strength governs

### Combined Tension and Shear Loading—for A7+ Adhesive Anchors

Allowable loads for anchors under tension and shear loading at the same time (combined loading) will be lower than the allowable loads for anchors subjected to 100% tension or 100% shear. For combined tension and shear loading, please see Section 4.2.2 of ICC ESR 3903

**PERFORMANCE TABLES**

**A7+ Hybrid Adhesive**

**Factored Concrete Breakout/Bond Failure Strength for Threaded Rod Tension, kN (lbf)**

Nominal anchor diameter In. (mm)	Effective Embedment In. (mm)	UNCRACKED			CRACKED		
		f <sub>c</sub> = 20 Mpa (2900 psi)	f <sub>c</sub> = 30 Mpa (4350 psi)	f <sub>c</sub> = 40 Mpa (5800 psi)	f <sub>c</sub> = 20 Mpa (2900 psi)	f <sub>c</sub> = 30 Mpa (4350 psi)	f <sub>c</sub> = 40 Mpa (5800 psi)
3/8 (9.5)	2-3/8 (60)	13.6 (3,060)	14.3 (3,215)	14.3 (3,215)	8.6 (1,925)	8.6 (1,925)	8.6 (1,925)
	3-3/8 (86)	20.3 (4,570)	20.3 (4,570)	20.3 (4,570)	12.2 (2,735)	12.2 (2,735)	12.2 (2,735)
	4-1/2 (114)	27.1 (6,095)	27.1 (6,095)	27.1 (6,095)	16.2 (3,645)	16.2 (3,645)	16.2 (3,645)
	7-1/2 (191)	45.2 (10,160)	45.2 (10,160)	45.2 (10,160)	27.0 (6,075)	27.0 (6,075)	27.0 (6,075)
1/2 (12.7)	2-3/4 (70)	17.0 (3,815)	20.8 (4,670)	22.1 (4,965)	9.9 (2,220)	9.9 (2,220)	9.9 (2,220)
	4-1/2 (114)	35.5 (7,985)	36.2 (8,130)	36.2 (8,130)	16.1 (3,630)	16.1 (3,630)	16.1 (3,630)
	6 (152)	48.2 (10,835)	48.2 (10,835)	48.2 (10,835)	21.5 (4,840)	21.5 (4,840)	21.5 (4,840)
	10 (254)	80.3 (18,060)	80.3 (18,060)	80.3 (18,060)	35.9 (8,065)	35.9 (8,065)	35.9 (8,065)
5/8 (15.9)	3-1/8 (79)	20.6 (4,620)	25.2 (5,660)	29.1 (6,535)	14.4 (3,235)	15.2 (3,425)	15.2 (3,425)
	5-5/8 (143)	49.6 (11,160)	56.5 (12,700)	56.5 (12,700)	27.4 (6,165)	27.4 (6,165)	27.4 (6,165)
	7-1/2 (191)	75.3 (16,935)	75.3 (16,935)	75.3 (16,935)	36.6 (8,220)	36.6 (8,220)	36.6 (8,220)
	12-1/2 (318)	125.5 (28,220)	125.5 (28,220)	125.5 (28,220)	61.0 (13,705)	61.0 (13,705)	61.0 (13,705)
3/4 (19.1)	3-1/2 (89)	24.4 (5,480)	29.8 (6,710)	34.5 (7,745)	17.1 (3,835)	20.9 (4,695)	21.1 (4,755)
	6-3/4 (171)	65.3 (14,670)	79.9 (17,970)	81.3 (18,290)	40.8 (9,170)	40.8 (9,170)	40.8 (9,170)
	9 (229)	100.5 (22,585)	108.5 (24,385)	108.5 (24,385)	54.4 (12,225)	54.4 (12,225)	54.4 (12,225)
	15 (381)	180.8 (40,640)	180.8 (40,640)	180.8 (40,640)	90.6 (20,375)	90.6 (20,375)	90.6 (20,375)
7/8 (22.2)	3-1/2 (89)	24.4 (5,480)	29.8 (6,710)	34.5 (7,745)	17.1 (3,835)	19.3 (4,335)	19.3 (4,335)
	7-7/8 (200)	82.2 (18,485)	93.4 (20,995)	93.4 (20,995)	43.4 (9,750)	43.4 (9,750)	43.4 (9,750)
	10-1/2 (267)	124.5 (27,990)	124.5 (27,990)	124.5 (27,990)	57.8 (13,000)	57.8 (13,000)	57.8 (13,000)
	17-1/2 (445)	207.5 (46,655)	207.5 (46,655)	207.5 (46,655)	96.4 (21,670)	96.4 (21,670)	96.4 (21,670)
1 (25.4)	4 (102)	29.8 (6,690)	36.5 (8,195)	42.1 (9,465)	20.8 (4,685)	23.8 (5,350)	23.8 (5,350)
	9 (229)	100.5 (22,585)	122.0 (27,420)	122.0 (27,420)	53.5 (12,040)	53.5 (12,040)	53.5 (12,040)
	12 (305)	154.7 (34,775)	162.6 (36,560)	162.6 (36,560)	71.4 (16,050)	71.4 (16,050)	71.4 (16,050)
	20 (508)	271.0 (60,935)	271.0 (60,935)	271.0 (60,935)	119.0 (26,750)	119.0 (26,750)	119.0 (26,750)
1-1/4 (31.8)	5 (127)	41.6 (9,355)	51.0 (11,455)	58.8 (13,225)	29.1 (6,545)	33.1 (7,440)	33.1 (7,440)
	11-1/4 (286)	140.4 (31,565)	172.0 (38,660)	190.6 (42,845)	74.5 (16,740)	74.5 (16,740)	74.5 (16,740)
	15 (381)	216.2 (48,600)	254.1 (57,125)	254.1 (57,125)	99.3 (22,320)	99.3 (22,320)	99.3 (22,320)
	25 (635)	423.5 (95,210)	423.5 (95,210)	423.5 (95,210)	165.5 (37,205)	165.5 (37,205)	165.5 (37,205)

**A7+ Hybrid Adhesive**

**Factored Concrete Breakout/Bond Failure Strength for Threaded Rod Shear, kN (lbf)**

Nominal anchor diameter In. (mm)	Effective Embedment In. (mm)	UNCRACKED			CRACKED		
		f <sub>c</sub> = 20 Mpa (2900 psi)	f <sub>c</sub> = 30 Mpa (4350 psi)	f <sub>c</sub> = 40 Mpa (5800 psi)	f <sub>c</sub> = 20 Mpa (2900 psi)	f <sub>c</sub> = 30 Mpa (4350 psi)	f <sub>c</sub> = 40 Mpa (5800 psi)
3/8 (9.5)	2-3/8 (60)	13.6 (3,060)	14.3 (3,215)	14.3 (3,215)	8.6 (1,925)	8.6 (1,925)	8.6 (1,925)
	3-3/8 (86)	40.7 (9,145)	40.7 (9,145)	40.7 (9,145)	24.3 (5,470)	24.3 (5,470)	24.3 (5,470)
	4-1/2 (114)	54.2 (12,190)	54.2 (12,190)	54.2 (12,190)	32.4 (7,290)	32.4 (7,290)	32.4 (7,290)
	7-1/2 (191)	90.4 (20,320)	90.4 (20,320)	90.4 (20,320)	54.1 (12,155)	54.1 (12,155)	54.1 (12,155)
1/2 (12.7)	2-3/4 (70)	33.9 (7,630)	41.6 (9,345)	44.2 (9,935)	19.7 (4,435)	19.7 (4,435)	19.7 (4,435)
	4-1/2 (114)	71.0 (15,970)	72.3 (16,255)	72.3 (16,255)	32.3 (7,260)	32.3 (7,260)	32.3 (7,260)
	6 (152)	96.4 (21,675)	96.4 (21,675)	96.4 (21,675)	43.1 (9,680)	43.1 (9,680)	43.1 (9,680)
	10 (254)	160.7 (36,125)	160.7 (36,125)	160.7 (36,125)	71.8 (16,130)	71.8 (16,130)	71.8 (16,130)
5/8 (15.9)	3-1/8 (79)	41.1 (9,245)	50.4 (11,320)	58.1 (13,070)	28.8 (6,470)	30.5 (6,855)	30.5 (6,855)
	5-5/8 (143)	99.3 (22,320)	113.0 (25,400)	113.0 (25,400)	54.9 (12,335)	54.9 (12,335)	54.9 (12,335)
	7-1/2 (191)	150.6 (33,865)	150.6 (33,865)	150.6 (33,865)	73.1 (16,445)	73.1 (16,445)	73.1 (16,445)
	12-1/2 (318)	251.1 (56,445)	251.1 (56,445)	251.1 (56,445)	121.9 (27,410)	121.9 (27,410)	121.9 (27,410)
3/4 (19.1)	3-1/2 (89)	48.7 (10,955)	59.7 (13,420)	68.9 (15,495)	34.1 (7,670)	41.8 (9,390)	42.3 (9,510)
	6-3/4 (171)	130.5 (29,340)	159.8 (35,935)	162.7 (36,575)	81.6 (18,340)	81.6 (18,340)	81.6 (18,340)
	9 (229)	200.9 (45,175)	216.9 (48,765)	216.9 (48,765)	108.8 (24,450)	108.8 (24,450)	108.8 (24,450)
	15 (381)	361.5 (81,280)	361.5 (81,280)	361.5 (81,280)	181.3 (40,755)	181.3 (40,755)	181.3 (40,755)
7/8 (22.2)	3-1/2 (89)	48.7 (10,955)	59.7 (13,420)	68.9 (15,495)	34.1 (7,670)	38.6 (8,670)	38.6 (8,670)
	7-7/8 (200)	164.5 (36,975)	186.8 (41,990)	186.8 (41,990)	86.8 (19,500)	86.8 (19,500)	86.8 (19,500)
	10-1/2 (267)	249.0 (55,985)	249.0 (55,985)	249.0 (55,985)	115.7 (26,005)	115.7 (26,005)	115.7 (26,005)
	17-1/2 (445)	415.0 (93,305)	415.0 (93,305)	415.0 (93,305)	192.8 (43,340)	192.8 (43,340)	192.8 (43,340)
1 (25.4)	4 (102)	59.5 (13,385)	72.9 (16,395)	84.2 (18,930)	41.7 (9,370)	47.6 (10,700)	47.6 (10,700)
	9 (229)	200.9 (45,175)	243.9 (54,840)	243.9 (54,840)	107.1 (24,075)	107.1 (24,075)	107.1 (24,075)
	12 (305)	309.4 (69,550)	325.3 (73,120)	325.3 (73,120)	142.8 (32,100)	142.8 (32,100)	142.8 (32,100)
	20 (508)	542.1 (121,870)	542.1 (121,870)	542.1 (121,870)	238.0 (53,500)	238.0 (53,500)	238.0 (53,500)
1-1/4 (31.8)	5 (127)	83.2 (18,705)	101.9 (22,910)	117.7 (26,455)	58.2 (13,095)	66.2 (14,880)	66.2 (14,880)
	11-1/4 (286)	280.8 (63,135)	343.9 (77,320)	381.2 (85,690)	148.9 (33,485)	148.9 (33,485)	148.9 (33,485)
	15 (381)	432.4 (97,200)	508.2 (114,250)	508.2 (114,250)	198.6 (44,645)	198.6 (44,645)	198.6 (44,645)
	25 (635)	847.0 (190,420)	847.0 (190,420)	847.0 (190,420)	331.0 (74,405)	331.0 (74,405)	331.0 (74,405)

1 These load values are for the purposes of estimation only and should not be used in design  
 2 Assuming single anchor with no edge or spacing distances, nor environmental factors that would reduce the load.  
 3 Design loads include their respective  $\phi_c$  and  $\phi_s$  material resistance factors for concrete and steel from CSA A23.3-14 Cl. 8.4.2 and 8.4.3  
 4 Design loads include their respective strength reduction factor for dry, water saturated and water filled hole conditions. Refer to design information table for threaded rod for submerged conditions ( $\phi_{sub}$ ).

5 All design loads are calculated according to Condition B for concrete failure mode factor R  
 6 Temperature Range A (long term temperature 43°C, short term temperature 55°C)  
 7 Temperature Range B (long term temperature 43°C, short term temperature 80°C)  
 8 Values for continuous inspection with dry, water saturated or water filled concrete



**PERFORMANCE TABLES**

**A7+ Hybrid Adhesive**

**Factored Concrete Breakout/Bond Failure Strength for Reinforcing Bars  
Tension, kN (lbf)**

US Rebar Size (mm)	Effective Embedment In. (mm)	UNCRACKED			CRACKED		
		f'c = 20 Mpa (2900 psi)	f'c = 30 Mpa (4350 psi)	f'c = 40 Mpa (5800 psi)	f'c = 20 Mpa (2900 psi)	f'c = 30 Mpa (4350 psi)	f'c = 40 Mpa (5800 psi)
# 3 (9.5)	3-1/2 (89)	20.0 (4,490)	20.0 (4,490)	20.0 (4,490)	9.0 (2,020)	9.0 (2,020)	9.0 (2,020)
	4-1/2 (114)	25.7 (5,770)	25.7 (5,770)	25.7 (5,770)	11.5 (2,595)	11.5 (2,595)	11.5 (2,595)
	7-1/2 (191)	42.8 (9,620)	42.8 (9,620)	42.8 (9,620)	19.2 (4,325)	19.2 (4,325)	19.2 (4,325)
# 4 (12.7)	4-1/2 (114)	35.5 (7,985)	39.5 (8,885)	39.5 (8,885)	15.4 (3,460)	15.4 (3,460)	15.4 (3,460)
	6 (152)	52.7 (11,850)	52.7 (11,850)	52.7 (11,850)	20.5 (4,615)	20.5 (4,615)	20.5 (4,615)
	10 (254)	87.8 (19,745)	87.8 (19,745)	87.8 (19,745)	34.2 (7,690)	34.2 (7,690)	34.2 (7,690)
# 5 (15.9)	5-3/4 (146)	51.3 (11,535)	62.0 (13,930)	62.0 (13,930)	24.6 (5,525)	24.6 (5,525)	24.6 (5,525)
	7-1/2 (191)	76.4 (17,185)	80.8 (18,170)	80.8 (18,170)	32.1 (7,210)	32.1 (7,210)	32.1 (7,210)
	12-1/2 (318)	134.7 (30,280)	134.7 (30,280)	134.7 (30,280)	53.4 (12,015)	53.4 (12,015)	53.4 (12,015)
# 6 (19.1)	6-3/4 (171)	65.3 (14,670)	78.2 (17,575)	78.2 (17,575)	26.9 (6,050)	26.9 (6,050)	26.9 (6,050)
	9 (229)	100.5 (22,585)	104.2 (23,430)	104.2 (23,430)	35.9 (8,065)	35.9 (8,065)	35.9 (8,065)
	15 (381)	173.7 (39,055)	173.7 (39,055)	173.7 (39,055)	59.8 (13,440)	59.8 (13,440)	59.8 (13,440)
# 7 (22.2)	8 (203)	84.2 (18,930)	103.1 (23,185)	104.0 (23,370)	37.2 (8,360)	37.2 (8,360)	37.2 (8,360)
	10-1/2 (267)	126.6 (28,465)	136.4 (30,675)	136.4 (30,675)	48.8 (10,975)	48.8 (10,975)	48.8 (10,975)
	17-1/2 (445)	227.4 (51,125)	227.4 (51,125)	227.4 (51,125)	81.4 (18,290)	81.4 (18,290)	81.4 (18,290)
# 8 (25.4)	9 (229)	100.5 (22,585)	123.1 (27,665)	131.9 (29,645)	47.8 (10,750)	47.8 (10,750)	47.8 (10,750)
	13 (330)	174.4 (39,210)	190.5 (42,820)	190.5 (42,820)	69.1 (15,530)	69.1 (15,530)	69.1 (15,530)
	20 (508)	293.0 (65,875)	293.0 (65,875)	293.0 (65,875)	106.3 (23,890)	106.3 (23,890)	106.3 (23,890)
# 9 (28.6)	10-1/2 (267)	126.6 (28,465)	155.1 (34,860)	170.1 (38,235)	62.8 (14,110)	62.8 (14,110)	62.8 (14,110)
	13-1/2 (343)	184.6 (41,495)	218.7 (49,155)	218.7 (49,155)	80.7 (18,145)	80.7 (18,145)	80.7 (18,145)
	20 (508)	323.9 (72,825)	323.9 (72,825)	323.9 (72,825)	119.6 (26,880)	119.6 (26,880)	119.6 (26,880)
# 10 (32.2)	12 (305)	154.7 (34,775)	189.5 (42,590)	211.1 (47,445)	82.2 (18,470)	82.2 (18,470)	82.2 (18,470)
	15 (381)	216.2 (48,600)	263.8 (59,310)	263.8 (59,310)	102.7 (23,090)	102.7 (23,090)	102.7 (23,090)
	25 (635)	439.7 (98,850)	439.7 (98,850)	439.7 (98,850)	171.2 (38,480)	171.2 (38,480)	171.2 (38,480)

**A7+ Hybrid Adhesive**

**Factored Concrete Breakout/Bond Failure Strength for Reinforcing Bars  
Shear, kN (lbf)**

US Rebar Size (mm)	Effective Embedment In. (mm)	UNCRACKED			CRACKED		
		f'c = 20 Mpa (2900 psi)	f'c = 30 Mpa (4350 psi)	f'c = 40 Mpa (5800 psi)	f'c = 20 Mpa (2900 psi)	f'c = 30 Mpa (4350 psi)	f'c = 40 Mpa (5800 psi)
# 3 (9.5)	3-1/2 (89)	39.9 (8,980)	39.9 (8,980)	39.9 (8,980)	18.0 (4,035)	18.0 (4,035)	18.0 (4,035)
	4-1/2 (114)	51.3 (11,545)	51.3 (11,545)	51.3 (11,545)	23.1 (5,190)	23.1 (5,190)	23.1 (5,190)
	7-1/2 (191)	85.6 (19,240)	85.6 (19,240)	85.6 (19,240)	38.5 (8,650)	38.5 (8,650)	38.5 (8,650)
# 4 (12.7)	4-1/2 (114)	71.0 (15,970)	79.1 (17,770)	79.1 (17,770)	30.8 (6,920)	30.8 (6,920)	30.8 (6,920)
	6 (152)	105.4 (23,695)	105.4 (23,695)	105.4 (23,695)	41.0 (9,225)	41.0 (9,225)	41.0 (9,225)
	10 (254)	175.7 (39,495)	175.7 (39,495)	175.7 (39,495)	68.4 (15,375)	68.4 (15,375)	68.4 (15,375)
# 5 (15.9)	5-3/4 (146)	102.6 (23,070)	123.9 (27,855)	123.9 (27,855)	49.2 (11,050)	49.2 (11,050)	49.2 (11,050)
	7-1/2 (191)	152.9 (34,365)	161.6 (36,335)	161.6 (36,335)	64.1 (14,415)	64.1 (14,415)	64.1 (14,415)
	12-1/2 (318)	269.4 (60,560)	269.4 (60,560)	269.4 (60,560)	106.9 (24,025)	106.9 (24,025)	106.9 (24,025)
# 6 (19.1)	6-3/4 (171)	130.5 (29,340)	156.3 (35,150)	156.3 (35,150)	53.8 (12,095)	53.8 (12,095)	53.8 (12,095)
	9 (229)	200.9 (45,175)	208.5 (46,865)	208.5 (46,865)	71.7 (16,125)	71.7 (16,125)	71.7 (16,125)
	15 (381)	347.4 (78,110)	347.4 (78,110)	347.4 (78,110)	119.6 (26,880)	119.6 (26,880)	119.6 (26,880)
# 7 (22.2)	8 (203)	168.4 (37,860)	206.2 (46,365)	207.9 (46,740)	74.4 (16,725)	74.4 (16,725)	74.4 (16,725)
	10-1/2 (267)	253.2 (56,925)	272.9 (61,350)	272.9 (61,350)	97.6 (21,950)	97.6 (21,950)	97.6 (21,950)
	17-1/2 (445)	454.8 (102,250)	454.8 (102,250)	454.8 (102,250)	162.7 (36,585)	162.7 (36,585)	162.7 (36,585)
# 8 (25.4)	9 (229)	200.9 (45,175)	246.1 (55,325)	263.7 (59,290)	95.6 (21,505)	95.6 (21,505)	95.6 (21,505)
	13 (330)	348.8 (78,420)	380.9 (85,640)	380.9 (85,640)	138.2 (31,060)	138.2 (31,060)	138.2 (31,060)
	20 (508)	586.1 (131,755)	586.1 (131,755)	586.1 (131,755)	212.6 (47,785)	212.6 (47,785)	212.6 (47,785)
# 9 (28.6)	10-1/2 (267)	253.2 (56,925)	310.1 (69,720)	310.1 (69,720)	125.5 (28,220)	125.5 (28,220)	125.5 (28,220)
	13-1/2 (343)	369.2 (82,990)	437.3 (98,315)	437.3 (98,315)	161.4 (36,285)	161.4 (36,285)	161.4 (36,285)
	20 (508)	647.9 (145,650)	647.9 (145,650)	647.9 (145,650)	239.1 (53,755)	239.1 (53,755)	239.1 (53,755)
# 10 (32.2)	12 (305)	309.4 (69,550)	378.9 (85,180)	422.1 (94,895)	164.3 (36,940)	164.3 (36,940)	164.3 (36,940)
	15 (381)	432.4 (97,200)	527.6 (118,615)	527.6 (118,615)	205.4 (46,175)	205.4 (46,175)	205.4 (46,175)
	25 (635)	879.4 (197,695)	879.4 (197,695)	879.4 (197,695)	342.3 (76,960)	342.3 (76,960)	342.3 (76,960)

1 These load values are for the purposes of estimation only and should not be used in design  
 2 Assuming single anchor with no edge or spacing distances, no environmental factors that would reduce the load.  
 3 Design loads include their respective  $\phi_c$  and  $\phi_s$  material resistance factors for concrete and steel from CSA A23.3-14 Cl. 8.4.2 and 8.4.3  
 4 Design loads include their respective strength reduction factor for dry, water saturated and water filled hole conditions. Refer to design information table for threaded rod for submerged conditions ( $\phi_{sub}$ ).

5 All design loads are calculated according to Condition B for concrete failure mode factor R  
 6 Temperature Range A (long term temperature 43°C, short term temperature 55°C)  
 7 Temperature Range B (long term temperature 43°C, short term temperature 80°C)  
 8 Values for continuous inspection with dry, water saturated or water filled concrete



**PERFORMANCE TABLES**

**A7+**  
**Hybrid Adhesive**

**Recommended Edge Distance Requirements for Shear Loads Installed in Solid Concrete**

ANCHOR DIAMETER In. (mm)		EMBEDMENT DEPTH In. (mm)		CRITICAL EDGE DISTANCE In. (mm) (100% LOAD CAPACITY)		INTERPOLATED EDGE DISTANCE In. (mm) (80% LOAD CAPACITY)		INTERPOLATED EDGE DISTANCE In. (mm) (50% LOAD CAPACITY)		MINIMUM EDGE DISTANCE In. (mm) (10% LOAD CAPACITY)	
3/8	(9.5)	3-3/8	(85.7)	4-3/16	(106.4)	3-7/16	(87.3)	2-5/16	(58.7)	13/16	(20.6)
1/2	(12.7)	4-1/2	(114.3)	5-5/8	(142.9)	4-5/8	(117.5)	3-1/8	(79.4)	1-1/8	(28.6)
5/8	(15.9)	5-5/8	(142.9)	7	(177.8)	5-3/4	(146.1)	3-1/8	(79.4)	1-3/8	(34.9)
3/4	(19.1)	6-3/4	(171.5)	8-7/16	(214.2)	6-15/16	(176.2)	4-5/8	(117.5)	1-5/8	(41.3)
1	(25.4)	9	(228.6)	11-1/4	(285.8)	9-1/4	(235.0)	6-1/4	(158.8)	2-1/4	(57.2)
1-1/4	(31.8)	11-1/4	(285.8)	14-1/16	(357.2)	11-5/8	(295.3)	7-7/8	(200.0)	2-7/8	(73.0)

**A7+**  
**Hybrid Adhesive**

**Recommended Edge Distance Requirements for Tension Loads Installed in Solid Concrete**

ANCHOR DIAMETER In. (mm)		EMBEDMENT DEPTH In. (mm)		CRITICAL EDGE DISTANCE In. (mm) (100% LOAD CAPACITY)		INTERPOLATED EDGE DISTANCE In. (mm) (90% LOAD CAPACITY)		INTERPOLATED EDGE DISTANCE In. (mm) (80% LOAD CAPACITY)		MINIMUM EDGE DISTANCE In. (mm) (70% LOAD CAPACITY)	
3/8	(9.5)	3-3/8	(85.7)	2-1/2	(63.5)	1-15/16	(49.2)	1-3/8	(34.9)	13/16	(26.2)
		4-1/2	(114.3)	3-3/8	(85.7)	2-5/8	(66.7)	1-7/8	(47.6)	1-1/8	(28.6)
1/2	(12.7)	4-1/2	(114.3)	3-3/8	(85.7)	2-5/8	(66.7)	1-7/8	(47.6)	1-1/8	(28.6)
		6	(152.4)	4-1/2	(114.3)	3-1/2	(88.9)	2-1/2	(63.5)	1-1/2	(38.1)
5/8	(15.9)	5-5/8	(142.9)	4-3/16	(106.4)	3-1/4	(82.6)	2-5/16	(58.7)	1-3/8	(34.9)
		7-1/2	(190.5)	5-5/8	(142.9)	4-3/8	(111.1)	3-1/8	(79.4)	1-7/8	(47.6)
3/4	(19.1)	6-3/4	(171.5)	5-1/16	(128.6)	3-15/16	(100.0)	2-13/16	(71.4)	1-5/8	(15.9)
		9	(228.6)	6-3/4	(171.5)	5-1/4	(133.4)	3-3/4	(95.3)	2-1/4	(57.2)
1	(25.4)	9	(228.6)	6-3/4	(171.5)	5-1/4	(133.4)	3-3/4	(95.3)	2-1/4	(57.2)
		12	(304.8)	9	(228.6)	7	(177.8)	5	(127.0)	3	(76.2)
1-1/4	(31.8)	11-1/4	(285.8)	8-7/16	(214.3)	6-9/16	(166.7)	4-3/4	(120.7)	2-7/8	(73.0)
		15	(381.0)	11-1/4	(285.8)	8-3/4	(222.2)	6-1/4	158.8)	3-3/4	(95.3)

## PERFORMANCE TABLES

### A7+ Hybrid Adhesive

### Grout-filled Concrete Block: Allowable Tension and Shear Loads based on Steel Design Information for U.S. Customary Unit Threaded Rod <sup>1, 2, 3</sup>

Anchor Diameter (in.)	Tension (lb)			Shear (lb)		
	ASTM A307 F <sub>u</sub> = 60 ksi	ASTM A193 Grade B7 F <sub>u</sub> = 125 ksi	ASTM F593 SS 304 F <sub>u</sub> = 100 ksi	ASTM A307 F <sub>u</sub> = 60 ksi	ASTM A193 Grade B7 F <sub>u</sub> = 125 ksi	ASTM F593 SS 304 F <sub>u</sub> = 100 ksi
3/8	2,185	4,555	3,645	1,125	2,345	1,875
1/2	3,885	8,100	6,480	2,000	4,170	3,335
5/8	6,075	12,655	10,125	3,130	6,520	5,215
3/4	8,750	18,225	12,390	4,505	9,390	6,385

For SI: 1 inch = 25.4mm, 1 lbf = 4.45N, 1ft-lbf = 1.356 N-M, 1 psi = 0.006895 MPa

1 Allowable load used in the design must be the lesser of bond values and tabulated steel element values.

2 Allowable tension and shear loads for threaded rods to resist short term loads, such as wind or seismic, must be calculated in accordance with Section 4.1 as applicable.

3 Allowable steel loads are based on allowable tension and shear stresses equal to 0.33X Fu and 0.17XFu, respectively.

### A7+ Hybrid Adhesive

### Grout-filled Concrete Block: Allowable Tension Loads for Threaded Rod <sup>1, 2, 3, 4, 7, 9, 10, 11, 12</sup>

Anchor Diameter (in.)	Minimum Embedment (inches)	Load at s <sub>cr</sub> and c <sub>cr</sub> (lb)	Spacing <sup>5</sup>			Edge Distance <sup>6</sup>		
			Critical s <sub>cr</sub> (inches)	Minimum s <sub>min</sub> (inches)	Load reduction factor for s <sub>min</sub> <sup>8</sup>	Critical c <sub>cr</sub> (inches)	Minimum c <sub>min</sub> (inches)	Load reduction factor for c <sub>min</sub> <sup>8</sup>
3/8	3-3/8	1,125	13.5	4	1.00	12	4	1.00
1/2	4-1/2	1,695	18	4	0.60	20	4	0.90
5/8	5-5/8	2,015	22.5	4	0.60	20	4	0.90
3/4	6-3/4	3,145	27	4	0.60	20	4	0.63

### A7+ Hybrid Adhesive

### Grout-filled Concrete Block: Allowable Shear Loads for Threaded Rod <sup>1, 2, 3, 4, 7, 9, 10, 11, 12</sup>

Anchor Diameter (in.)	Minimum Embedment (inches)	Load at s <sub>cr</sub> and c <sub>cr</sub> (lb)	Spacing <sup>5</sup>			Edge Distance <sup>6</sup>		
			Critical s <sub>cr</sub> (inches)	Minimum s <sub>min</sub> (inches)	Load reduction factor for s <sub>min</sub> <sup>8</sup>	Critical c <sub>cr</sub> (inches)	Minimum c <sub>min</sub> (inches)	Load reduction factor for c <sub>min</sub> <sup>8</sup>
3/8	3-3/8	750	13.5	4	0.50	12	4	0.95
1/2	4-1/2	1,520	18	4	0.50	20	4	.044
5/8	5-5/8	2,285	22.5	4	0.50	22	4	0.26
3/4	6-3/4	2,345	27	4	0.50	20	4	0.26

For SI: 1 inch = 25.4mm, 1 lbf = 0.0044 kN, 1 ksi = 6.894 MPa. (Refer to Table 4 for footnotes)

- All values are for anchors installed in fully grouted concrete masonry with minimum masonry strength of 1500 psi (10.3 MPa). Concrete masonry units must be light-, medium-, or normal-weight conforming to ASTM C 90. Allowable loads have been calculated using a safety factor of 5.0.
- Anchors may be installed in any location in the face of the masonry wall (cell, web, bed joint) as shown in Figure 2.
- A maximum of two anchors may be installed in a single masonry cell in accordance with the spacing and edge or end distance requirements. Embedment is measured from the outside surface of the concrete masonry unit to the embedded end of the anchor. See Figure 2 of this report.
- The critical spacing distance, s<sub>cr</sub>, is the anchor spacing where full load values in the table may be used. The minimum spacing distance, s<sub>min</sub>, is the minimum anchor spacing for which values are available and installation is permitted. Spacing distance is measured from the centerline to centerline between two anchors.
- The critical edge or end distance, c<sub>cr</sub>, is the distance where full load values in the table may be used. The minimum edge or end distance, c<sub>min</sub>, is the minimum distance for which values are available and installation is permitted. Edge or end distance is measured from anchor centerline to the closest unrestrained edge.
- The tabulated values are applicable for anchors in the ends of grout-filled concrete masonry units where minimum edge distances are maintained.
- Load values for anchors installed less than s<sub>cr</sub> and c<sub>cr</sub> must be multiplied by the appropriate load reduction factor based on actual spacing (s) or edge distance (c). Load factors are multiplicative; both spacing and edge reduction factors must be considered.
- Linear interpolation of load values between minimum spacing (s<sub>min</sub>) and critical spacing (s<sub>cr</sub>) and between minimum edge or end distance (c<sub>min</sub>) and critical edge or end distance (c<sub>cr</sub>) is permitted.
- Concrete masonry width (wall thickness) must be equal to or greater than 1.5 times the anchor embedment depth (e.g. 3/8-inch- and 1/2-inch-diameter anchors are permitted in minimum nominally 6-inch-thick concrete masonry). The 5/8- and 3/4-inch-diameter anchors must be installed in minimum nominally 8-inch-thick concrete masonry.
- Allowable loads must be the lesser of the adjusted masonry or bond values tabulated above and the steel strength values given in Table 2.
- Tabulated allowable bond loads must be adjusted for increased in-service base material temperatures in accordance with Figure 1, as applicable.

## PERFORMANCE TABLES

### A7+ Hybrid Adhesive

### Grout-filled Concrete Block: Allowable Tension and Shear Loads for Rebar<sup>1, 2, 3</sup>

Rebar Size	Tension (lb)	Shear (lb)
	ASTM A615, Grade 60	ASTM A615, Grade 60
No. 3	3,270	1,685
No. 4	5,940	3,060
No. 5	9,205	4,745
No. 6	13,070	6,730

For SI: 1 inch = 25.4mm, 1 lbf = 4.45N, 1ft-lbf = 1.356 N-M, 1 psi = 0.006895 MPa

1 Allowable load used in the design must be the lesser of bond values and tabulated steel element values.

2 Allowable tension and shear loads for threaded rods to resist short term loads, such as wind or seismic, must be calculated in accordance with Section 4.1 as applicable.

3 Allowable steel loads are based on allowable tension and shear stresses equal to 0.33X Fu and 0.17X Fu, respectively.

### A7+ Hybrid Adhesive

### Grout-filled Concrete Block: Allowable Tension Loads for Rebar<sup>1, 2, 3, 4, 7, 9, 10, 11, 12</sup>

Anchor Diameter (in.)	Minimum Embedment (inches)	Load at $s_{cr}$ and $c_{cr}$ (lb)	Spacing <sup>5</sup>			Edge Distance <sup>6</sup>		
			Critical $s_{cr}$ (inches)	Minimum $s_{min}$ (inches)	Load reduction factor for $s_{min}$ <sup>8</sup>	Critical $c_{cr}$ (inches)	Minimum $c_{min}$ (inches)	Load reduction factor for $c_{min}$ <sup>8</sup>
3/8	3-3/8	1,530	13.5	4	1.00	12	4	1.00
1/2	4-1/2	1,845	18	4	0.60	20	4	0.90
5/8	5-5/8	2,465	22.5	4	0.60	20	4	0.90
3/4	6-3/4	2,380	27	4	0.60	20	4	0.63

### A7+ Hybrid Adhesive

### Grout-filled Concrete Block: Allowable Shear Loads for Rebar<sup>1, 2, 3, 4, 7, 9, 10, 11, 12</sup>

Anchor Diameter (in.)	Minimum Embedment (inches)	Load at $s_{cr}$ and $c_{cr}$ (lb)	Spacing <sup>5</sup>			Edge Distance <sup>6</sup>		
			Critical $s_{cr}$ (inches)	Minimum $s_{min}$ (inches)	Load reduction factor for $s_{min}$ <sup>8</sup>	Critical $c_{cr}$ (inches)	Minimum $c_{min}$ (inches)	Load reduction factor for $c_{min}$ <sup>8</sup>
3/8	3-3/8	1,410	13.5	4	0.50	12	4	0.95
1/2	4-1/2	1,680	18	4	0.50	20	4	0.44
5/8	5-5/8	3,245	22.5	4	0.50	12	4	0.26
3/4	6-3/4	4,000	27	4	0.50	20	4	0.26

For SI: 1 inch = 25.4 mm; 1 lbf = 0.0044 kN, 1 ksi = 6.894 MPa.

(The following footnotes apply to both Tables 6 and 7)

1 All values are for anchors installed in fully grouted concrete masonry with minimum masonry strength of 1500 psi (10.3 MPa). Concrete masonry units must be light-, medium, or normal-weight conforming to ASTM C 90. Allowable loads have been calculated using a safety factor of 5.0.

3 Anchors may be installed in any location in the face of the masonry wall (cell, web, bed joint) as shown in figure 2.

4 A maximum of two anchors may be installed in a single masonry cell in accordance with the spacing and edge or end distance requirements. Embedment is measured from the outside surface of the concrete masonry unit to the embedded end of the anchor. See Figure 2 of this report.

5 The critical spacing distance,  $s_{cr}$ , is the anchor spacing where full load values in the table may be used. The minimum spacing distance,  $s_{min}$ , is the minimum anchor spacing for which values are available and installation is permitted. Spacing distance is measured from the centerline to centerline between two anchors.

6 The critical edge or end distance,  $c_{cr}$ , is the distance where full load values in the table may be used. The minimum edge or end distance,  $c_{min}$ , is the minimum distance for which values are available and installation is permitted. Edge or end distance is measured from anchor centerline to the closest unrestrained edge.

7 The tabulated values are applicable for anchors in the ends of grout-filled concrete masonry units where minimum edge distances are maintained.

8 Load values for anchors installed less than  $s_{cr}$  and  $c_{cr}$  must be multiplied by the appropriate load reduction factor based on actual spacing ( $s$ ) or edge distance ( $c$ ). Load factors are multiplicative; both spacing and edge reduction factors must be considered.

9 Linear interpolation of load values between minimum spacing ( $s_{min}$ ) and critical spacing ( $s_{cr}$ ) and between minimum edge or end distance ( $c_{min}$ ) and critical edge or end distance ( $c_{cr}$ ) is permitted.

10 Concrete masonry width (wall thickness) must be equal to or greater than 1.5 times the anchor embedment depth (e.g. No. 3 and No. 4 reinforcing bars are permitted in minimum nominally 6-inch-thick concrete masonry). No. 5 and No. 6 reinforcing bars must be installed in minimum nominally 8-inch-thick concrete masonry.

11 Allowable loads must be the lesser of the adjusted masonry or bond values tabulated above and the steel strength values given in Table 4.

12 Tabulated allowable bond loads must be adjusted for increased in-service base material temperatures in accordance with Figure 1, as applicable.